

A STUDY OF THE PHYSICAL FITNESS PHASE  
OF THE BOYS' PHYSICAL EDUCATION PROGRAM  
AT BROOMFIELD HIGH SCHOOL, BROOMFIELD, COLORADO

by

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## INTRODUCTION

This report is based upon the development of a physical fitness program in the Broomfield High School boys' physical education classes. Broomfield High School is in the Boulder Valley School District--the wealthiest district, per capita income, in Colorado. So, facility-wise this school will have an outstanding rating in the future, while the last three years it has been about average. This program is still in the early stages of development, so it only gives an indication of what has been and will be done in an isolated situation.

This report takes into account one-half of the program and it is referred to as the physical fitness program. The other half of this program is the learning process. In the physical fitness program, the concern is with the development of strength, speed, endurance, agility, and flexibility.

This report contains methods of physical fitness development and methods of testing that have been used and studied by the writer. These methods are designed to fit the local situation so that the results may be assumed to be valid and meaningful. Details are not shunned and the procedures are quite clear. The program is complete considering the situation and the time of its development.

It was found that for a physical fitness program to be successful it must be geared to the specific situation at hand. In physical education classes, such as the class at Broomfield High School, the students come from upper middle-class families and

there is little deviation from this pattern. Many of the students have some form of motor vehicle transportation to and from school. All boys must enroll in physical education for two years in high school. Inter-school athletics does not excuse a boy from physical education. It may be justly assumed then, that there will be a wide variation in physical fitness, between the athlete and the non-athlete. For this reason, physical education has an important responsibility to the student and his physical fitness.

There are four procedures that must be followed if the study of a physical fitness program is to be successful.

1. Identification of ways in which kinesthesia is demonstrated in motor performances.
2. Selection of tasks, based on these expressions of kinesthesia, suited to objective measurement.
3. Determination of the inter-relationship of measures and the contribution of each measure to the concept of total kinesthesia.
4. Ascertaining the relationship of levels of kinesthetic acuity to learning facility and motor accomplishment.<sup>1</sup>

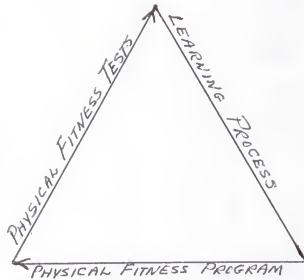
A physical education program must not neglect or over-emphasize physical fitness. To neglect fitness causes an evident result. To overemphasize the physical fitness of a student would mean neglecting the learning process, which is equally important.

Because time is so scarce for planning the physical

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<sup>1</sup>Gladys M. Scott, Report of the International Congress, The American Assn. for Health, Physical Education and Recreation, Washington, D. C., 1955.

education program one should begin with the learning process and decide what activities to teach and how to teach them. Then a physical fitness program is incorporated into the learning process. At the beginning and end of each school year, the students are given American Association for Health, Physical Education, and Recreation physical fitness tests to evaluate that phase of the program. Through these tests, the learning process is planned. Therefore, a cycle as follows is suggested:



## PURPOSE OF A PHYSICAL FITNESS PROGRAM

The aim of physical education at Broomfield High School is to provide each student with as many opportunities as possible to develop himself through the realm of physical activities. There are four important objectives in reaching this aim.

1. Appreciation of spectator sports.
2. Knowledge and skill in carry-over activities.
3. Knowledge and skill in activities designed for intramural and interschool competition.
4. The development of physical fitness.

It was found that there was some duplication in the four objectives mentioned above. In carry-over activities, such as golf, tennis, table tennis, shuffleboard, badminton, horseshoe pitching, and archery, some physical conditioning was required. This indicated that a student participating only in this type of activity was in much poorer physical condition than after he had participated in a good physical fitness program.

## PURPOSE OF TESTING PHYSICAL FITNESS

The purpose of testing physical fitness at Broomfield High School is two-fold. The first purpose is to evaluate each individual student and secondly to evaluate the total program. The physical fitness test does not affect the students' academic grade. There are two schools of thought on this subject. One is that a high school student needs to be motivated through grading. The other is that grading should parallel learning. The latter philosophy has been adopted at Broomfield High School. There are many ways to motivate an individual. One was through competition. The highest score was recorded and placed on a chart by the name of the student who received it. This record was a goal that each boy tried to break.

Another way that the student was motivated was through his own improvement. Each boy worked to exceed his individual record. The accomplishment felt in his own development compensated for the hard work.

Every student is evaluated so that weakness may be improved. A student's weakness falls into one of two categories--the isolated and the common low scores. If a boy falls into the former category, he is assigned extra work outside of school. If the problem is the latter, the physical education program is developed to fit the need.

The physical fitness testing has a great deal to do with the planning of the total physical education program. If an individual or group rate low in any of the following categories--

strength, speed, endurance, or agility; or lower in one than the other, then activities were selected the following semester that might help to improve the weakness.



## PURPOSE OF THE PROBLEM

The purpose of this report is to study and evaluate the physical fitness program at Broomfield High School.

This report will be used to provide information for the Boulder Valley School District concerning the program at Broomfield High School.

Another purpose of the report is to provide the Kansas State University Physical Education Department with information concerning this high school and its physical education program.

## DEFINITION OF TERMS

**Physical Fitness**--In defining physical fitness in a physical education program, the definition must be qualified. Physical fitness may include everything that has to do with the physical aspect of a person's life. It may include nutrition, habits, safety rules, rest, exercise, and even learning. Physical fitness is determined by the individual and his tasks. If an individual is able to complete a particular task that he sets out to do and has enough energy left over for an emergency, he is physically fit for that particular task.

**Agility**--Ability to change body positions and directions quickly.

**Strength**--The power of a muscle contraction.

**Endurance**--The ability to hold a muscle contraction over a period of time.

**Speed**--The ratio of time taken to work accomplished.

**Percentile Score**--Indicates an individual's superiority over the specified number of such groups of a distribution and inferiority to the remaining groups.

## METHODS OF PHYSICAL FITNESS DEVELOPMENT

It was found that a physical fitness program can be fitted into almost any physical activity. This is more difficult to do in some activities than in others. Gymnastics was proved to be one of the best physical conditioning activities in the program. Track and field and wrestling are also good. On the other hand, volleyball and touch football are not good all-round physical conditioning activities, unless supplemented with drills of a calisthenic nature. There is too much standing around by some of the students while others do all of the work. Some of the drills that are used for various sports are as follows:

### Touch Football

Passing and Chasing. Two players are ten yards apart, one on the 50-yard line and the other on the 40-yard line. The one on the 50-yard line passes to the one on the 40-yard line and chases him until he catches him. When one is caught he stops until the other is ten yards ahead, then he passes and chases. They go around both goal posts, and back to the 50-yard line.

Crab Face-off. Two boys face each other in the crab position, and one moves with the other, staying nose to nose. This gives the arms, as well as the legs, a good workout.

### Soccer

This can be played in the crab and inverted crab position, which gives the arms a good workout. Also, when a boy commits a

foul, he must do a certain number of push-ups or sit-ups.

### Volleyball

The number of calisthenics are increased and the number of repetitions that are used for warm-up are doubled. At the close of each class period each student is required to run twenty laps around the volleyball court, which amounts to about three-fourths of a mile.

### Basketball

One should plan to run a lot of wind sprints and relays during this unit. Some of the relays used are the wheelbarrow, crab, and inverted crab, in addition to skills relays. Also a weighted basketball can be used for passing. A variety of one-on-one drills should be used and advantage drills, that put the pressure on one or two students, making them do all of the work.

### Wrestling

This is one of the best conditioning units. Wrestling alone is a very good conditioning exercise. Running should be put into this unit to add motion.

### Gymnastics

This is one of the best all-around conditioning units. A certain amount of strength and endurance is required. The first half of the unit should be devoted to calisthenics, for the beginning of each period. The student does thirty push-ups,

fifteen inverted push-ups, thirty sit-ups, three to five minutes of continuous leg-lifts, fifteen squat jumps, five minutes of continuous side-straddle hops, ten sit-lifts pike position, ten sit-lifts tuck position, ten back drops, plus several flexibility exercises, going from one exercise into another without rest.

### Track and Field

This unit has so much variety that, at Broomfield High School, a requirement is made that each student must pass a certain skill test for a grade in each event. This requirement encourages him to work on the events in which he is weakest. The classes are also divided into squads and each squad gets grade points on the total number of individual points of its members. Each member of each squad must participate in each of these track and field events. Certain records are kept for the events and for the number of repetitions of calisthenics.

### Softball

Again, because this sport allows much idleness, the calisthenics must be increased. Drills that are good for conditioning should be used. Running a man down between bases, which is called "the trap" is good for endurance and agility. Four students can be used at one time. There is a man on each base, a chaser and the runner. The chaser chases the runner toward the base and throws to the man on the base. The man on the base then becomes the chaser and the chaser becomes the man on the base. Each student is timed, once a week, running the bases. The

bases are put ninety feet apart. Each student is required to run two laps each day around the outfield.

There are activities that have not been used in the past because of lack of facilities and equipment, but will be used in the near future. Some of these are golf, tennis, archery, and rhythms. These will be handled in the same manner. One could make an assumption that enough vigorous exercise is contained in the program, so that each student obtains a good workout during each class period.

A number of isolated techniques are used for developing physical fitness, other than fitting body building activities into the learning process. One method, which is showing promise, is the use of isometric ropes. There are forty different exercises, using these ropes, which work every large muscle in the body. This set of isometric ropes and illustrations of the exercises may be purchased through any reputable sporting goods store. The one disadvantage of this method is the lack of movement.

These ropes are used once or twice a week, for fifteen minutes, and the student works with partners and in squads. Ropes are issued to each squad leader and it is his responsibility to see that they are returned at the end of each class period.

Another activity used in the program is running an obstacle course. Outdoors, an obstacle course is designed that almost any school could develop. It consists of a track, bleachers, a ditch, a broad-jumping pit, a baseball diamond, baseball bleachers, and a row of tires. The starting line is the starting line for the

one hundred yard dash; the first obstacle is the bleachers. The student must run up one end of the bleachers (the top row is about twenty feet high), then climb down the back side, run to the other end and climb up the back side, run down that end of the bleachers, and crawl the length of the bleachers under the lowest row. The student then runs around the track to the other side of the football field and crawls in a crab position, the length of a ditch, which parallels the football field. The next obstacle is the broad jumping pit, which has five car tires side by side. The student must jump over this obstacle. If he does not clear it, he has to try a second time. The student then runs around the outfield fence of the baseball field, which is about one hundred yards from the football field, then under the bleachers on each side of the backstop, and finally to the finish line (also the starting line).

Indoors, the course is more interesting because of the gymnastics equipment involved. The obstacles are arranged in a circle around the gym, beginning with the mats, and ending with rope climbing. Mats are laid down one side of the gym. The trampoline is placed over the mats about twenty feet from the starting line. The student is required to begin with two dives before he reaches the trampoline, then pivot. He then does a series of backward rolls under the trampoline. At the end of the mats is a spring board and five hair mats stacked on top of each other. The student then does a forward somersault or dive (the somersault is quicker, but some students cannot do it). Along the end wall there are four vertical "I" beams about fifteen feet



apart, with a horizontal "I" beam across the top of them. The student climbs the first vertical "I" beam, climbs across to the second vertical "I" beam on the horizontal "I" beam, down the second, runs to the third, up the third, across to the fourth, down the fourth. He then crawls under a bench. The next obstacle is a side horse, which is raised chest height, about twenty feet away from the bench. He vaults the side horse, then climbs to the top one of the eighteen foot ropes. This is the finish line.

The facilities and equipment at Broomfield High School are not elaborate. Most high schools have the same facilities and equipment, or their equivalent. Because of the facilities, equipment, and circumstances that would be found in a gymnasium, exercises are mainly for the upper part of the body. The outdoor exercises concentrate upon the legs.

Next year, the school will purchase a set of weights and will add a weight training program of some type to the course of physical fitness.

It has not been decided how to insert this into the program, but it will probably be done in one of the following ways. One would be to use it as a piece of apparatus and fit it into the gymnastics program. It has been the writer's policy to attempt to keep all of the students busy most of the time. A weight training program is contrary to this ideal. Working in squads and using a rotation of these squads would make possible this ideal of keeping everyone busy.

Another method of using weights would be to use them during



the warm-up period. Using this method it would be more difficult to keep everyone busy. One way of striving to do this, would be to use an increasing requirement warm-up program, beginning with body stretching exercises, then increasing the number of repetitions as the calisthenics become more difficult. The students able to accomplish all of the required repetitions of an isolated exercise would then perform exercises with the weights, such as a certain number of arm curls. Then, they would go on to the next calisthenic. A student who could perform only two-thirds of the number of required repetitions of the calisthenic could be required to rest and perform the two-thirds again. A student who could perform only one-half of them would have to perform one-half of them three times before he could do the weight training exercise. This method would not be satisfactory in most cases, because it is too time consuming and the students would be waiting for the weights much of the time.

A third method is using a weight training program as a separate unit. Weight training is the use of weights, lifting for the purpose of achieving strength, speed, flexibility, agility, and endurance. This differs from weight lifting, in that the aim in weight lifting is to gain strength, endurance, balance, and to lift as much weight as possible. In so doing, flexibility, speed and agility are very often neglected. It may be assumed that in most schools the physical education classes have some form of a modified weight training program, whether instructors realize it or not. Weight training does not necessarily require the use of weight lifting equipment. The weight

of the student's own body is an important weight to consider. Any resistance that requires the use of the muscle is connected, directly or indirectly, with weight. So, in a weight training unit, a number of activities can be listed that would fit very well into a weight training program. One would be the use of weight lifting equipment.

It must be remembered that weight training is not weight lifting. Adding more weight to the exercise is not necessarily the important consideration. On the contrary, it may be harmful to the student. The increase in repetitions to the poundage will vary among students, but usually the rate is ten repetitions to one pound for the wrist curls. This would mean that a student would begin with the maximum amount of weight with which he could perform ten wrist curls. He would then work up to twenty repetitions, add one pound and decrease the number of repetitions to ten again. The ratio for each exercise will be different. The forearm curl would have a lower ratio because of better leverage and more muscles. The back and leg exercises would have the lowest ratio, because the back contains the largest muscles and the legs contain the strongest muscles.

Weights can be used effectively with other activities. According to literature and many coaches and physical educators that this writer has contacted, weights are used in the sports coached and in the physical education classes taught.

Running is a very good activity that can be used along with a weight training program. This can be used as a change of pace instead of having rest periods.

Basketball, volleyball, wrestling, and other gymnasium games and contests provide excellent opportunities for weight training exercises. While a team is waiting for its turn to play, or during a rest period, they can be participating in the weight training routine.

Another activity would be of an arm-flexor variety. This would include pull-ups, rope climbing, obstacle climbing, the kip-up or upswing exercises, and the rowing exercises. This group of activities would be geared mostly to the flexor muscles of the arm, chest, and abdomen. These activities have been used in the Broomfield High School program. The chinning bar used is a piece of pipe, that is part of the brace of the basketball goals. It is two-inch pipe, which is a half-inch larger than is recommended by the AAHPER (American Association for Health, Physical Education and Recreation), but it is the only equipment available. Chinning bars have been made in the past, but they were unstable, unsafe, and they did not last. Next year, a horizontal bar will be purchased.

Because of the lack of facilities, the pull-ups were included in the gymnastics program. The gymnastics program is divided into three group requirements: the beginning, intermediate, and advanced groups. The students have worked hard to advance to the intermediate and advanced groups. In the beginning group, five pull-ups are required. Ten pull-ups are required for the intermediate group and fifteen pull-ups for the advanced group.

There are four ropes, eighteen feet high, which have tape

marks at heights of twelve, fourteen, sixteen, and eighteen feet. The students begin in a sitting position and are not allowed to use their feet, either to climb with or to push off of the floor. Individual records are kept at each weight to measure improvement. For the requirement groups in gymnastics, only the eighteen-foot mark is used. The time requirement for this is fifteen seconds for the beginning group, twelve seconds for the intermediate, and nine seconds for the advanced group.

The obstacle climbing program is done through the obstacle course program. It is limited due to facilities. This has been described previously and will not be repeated here.

The upswing activity would be used on the parallel bars and the horizontal bar. This activity will be included in the gymnastic routine exclusively.

The rowing activity is also limited in the program because of the lack of special equipment needed for this activity. There are very few calisthenic exercises that are a modified form of rowing.

At Broomfield High School, the isometric rope exercises are used as a weight training program. This program is substituted with the large muscle calisthenic exercises once a week.

## METHODS FOR TESTING PHYSICAL FITNESS

There are several physical fitness tests that have the characteristics which qualify them for a physical education class situation. In a physical education class, there are limitations that must be considered, such as the limitation of time. The test must not be extensive, yet must have a high degree of validity. It must cover all of the important areas of the body. Testing a large number of students is time consuming and requires a certain degree of simplicity. It should be a test whereby a reliable and bright student is capable of administering it. There is the limitation of facilities and equipment.

There are tests that require a measurement in pounds and degrees. Gladys M. Scott (page 5) conducted tests of this nature on one hundred college women. These tests included twenty-five separate tests, ranging from a finger-spread to a leg-force. This type of testing may have a higher validity rate, but it is very impractical in high school physical education classes.

In recent years, there have been several studies made that make a good description of a student's physical fitness. One such group of tests is distributed in a booklet by the President's Council on Youth Fitness. It is titled Youth Physical Fitness. It contains suggested elements of a school-centered program. The tests include pull-ups, sit-ups, squat thrusts, shuttle run, standing broadjump, fifty-yard dash, softball throw, and the 600-yard run-walk. These tests are scored excellent, good, satisfactory, and poor, and according to age. The ages

range from ten to seventeen.

The Royal Canadian Air Force has an exercise booklet that contains a scientifically developed progression system of exercises. The progression is according to ability and contains six charts. Each chart contains four parts as follows:

1. Physical capacity levels which are indicated by a letter of the alphabet. They range from a D- to an A+.
2. Five exercises are contained in each chart with the number of repetitions indicated related to the physical capacity level.
3. The allotted time for each exercise is indicated at the bottom of each chart, under each exercise. These times remain the same throughout all the charts.
4. Under each chart are progression groups. The groups are physique category groups, age groups, and flying crew groups. The physique category group is a classification of three body builds, stocky, medium, and linear (this group is for persons under eighteen years of age). The age groups and flying crew groups are according to age.

The individual progresses from the first chart to the chart indicated by his progression group.

The American Association for Health, Physical Education, and Recreation launched its Youth Fitness Project in 1957. This project marked the first attempt of this Association to conduct a nationwide survey of this nature. This survey included 8500 boys and girls, in grades five through twelve, as subjects. The tests



contain sit-ups, pull-ups, standing broadjump, fifty-yard dash, shuttle run, softball throw for distance, and the 600-yard run-walk. The tests are graded according to percentile scores. The percentile scores are standards set up for national rankings, so that each student may know how he ranks nationally.

The American Association for Health, Physical Education, and Recreation Physical Fitness Tests are the group of tests that are used in the boys physical education classes at Broomfield High School. The following are reasons for selecting this group of tests:

1. The tests are not time consuming.
2. The tests do not require the extensive use of facilities.
3. The tests can be evaluated on a national basis.
4. The tests can be administered to a large group of students at one time.
5. Large muscle activity areas are measured, such as strength, speed, endurance, and agility.
6. In considering the above reasons for selection and the total physical education program, this group of tests met the evaluative needs of the program.

## ADMINISTERING THE AAHPER YOUTH FITNESS TESTS

In administering tests of this nature, it was found that the procedure must have certain qualities. The qualities are:

1. There must be a high degree of validity.
2. The procedure must take as little time as possible, but still be reliable.
3. The procedure must keep every student busy most of the time.
4. The procedure must contain the maximum use of facilities and equipment.
5. The procedure must provide for make-up tests for those students who are absent.
6. The procedure should have a valid evaluation method.

Each class was divided into four squads. The squad leader was selected by the teacher. The qualities the teacher looks for in the squad leader are:

1. Honesty
2. Intelligence
3. Interest
4. Leadership
5. Reliability

The squad leader acts as an aide in conducting the tests for his squad. The seven tests are conducted on a class rotation system, among squads. There are seven stations representing the seven tests. Squads one, two, three, and four would begin at stations one, two, three, and four, respectively, and could not



advance to the next station until the squad at that station was ready to advance to its succeeding station. For example, squad one would have to wait at station one until squad two was ready to advance to station three.

Each student had a score card made of tag-board that was kept in the hands of the squad leader or teacher. This score card is illustrated on the next page.

At the beginning of each class period, the squad leaders were furnished with a clipboard, a ballpoint pen, and the score cards of the students in their squads. The tape measure, stop watch, softball, and shuttle run blocks were kept by the teacher until a squad leader was ready to use one of the pieces of equipment just mentioned. The squad leader was required to return this equipment to the teacher as soon as he was through with it. The squad leader was also required to get the teacher's approval if he was going to use another student to help give the tests.

Student \_\_\_\_\_ School \_\_\_\_\_ Teacher \_\_\_\_\_

Sit-ups	Pull-ups	Standing Broad-jump	50-yard Dash	Shuttle Run	Soft-ball Throw	600-yd. run-walk	Average Percentile Score
Age 14							
September							
Percentile							
May							
Percentile							
Age 15							
September							
Percentile							
May							
Percentile							
Age 16							
September							
Percentile							
May							
Percentile							
Age 17							
September							
Percentile							
May							
Percentile							
Age 18							
September							
Percentile							
May							
Percentile							

## THE AAHPER TEST SCALE

PERCENTILE SCORE	13 years	14 years	15 years	16 years	17 years
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## SIT-UPS

100	99	99	99	99	99
95	99	99	99	99	99
90	78	73	99	99	99
85	60	60	70	73	83
80	54	60	60	73	63
75	50	53	54	62	60
70	48	50	50	55	55
65	44	50	50	51	51
60	40	44	45	50	50
55	37	41	41	48	48
50	35	39	40	44	44
45	33	36	37	41	40
40	30	33	35	40	38
35	30	31	32	36	35
30	26	30	30	34	32
25	25	26	29	32	30
20	22	25	25	30	28
15	20	21	23	26	25
10	17	19	20	22	24
5	12	15	15	18	20
0	1	1	1	3	0

## PULL-UPS

100	14	15	20	18	16
95	8	10	10	13	12
90	7	8	9	11	11
85	6	7	8	10	10
80	5	6	7	9	10
75	4	5	6	8	9
70	4	5	5	7	8
65	4	5	5	7	7
60	3	4	5	6	7
55	3	3	4	6	6
50	2	3	4	5	6
45	2	2	4	5	5
40	2	2	3	4	5
35	1	2	3	4	4
30	1	1	2	3	4
25	1	1	2	3	3
20	0	1	1	3	3
15	0	0	1	2	3
10	0	0	1	2	2
5	0	0	0	1	1
0	0	0	0	0	0

PERCENTILE SCORE	13 years	14 years	15 years	16 years	17 years
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## STANDING BROAD JUMP

100	7 9	8 5	8 6	9 0	9 1
95	6 8	7 2	7 8	8 0	8 4
90	6 5	7 0	7 4	7 9	8 0
85	6 3	6 8	7 1	7 6	7 9
80	6 0	6 7	7 0	7 3	7 8
75	5 11	6 6	6 9	7 2	7 7
70	5 10	6 3	6 8	7 1	7 5
65	5 9	6 2	6 7	7 0	7 4
60	5 8	6 1	6 5	6 11	7 2
55	5 6	5 11	6 4	6 9	7 0
50	5 5	5 10	6 2	6 8	6 11
45	5 4	5 9	6 0	6 6	6 9
40	5 2	5 7	5 11	6 4	6 8
35	5 1	5 6	5 9	6 3	6 6
30	4 11	5 4	5 8	6 2	6 4
25	4 10	5 3	5 7	6 0	5 2
20	4 8	5 2	5 5	5 10	6 0
15	4 6	5 0	5 3	5 8	5 11
10	4 4	4 9	5 0	5 4	5 9
5	4 0	4 6	4 9	5 0	5 5
0	2 10	3 4	2 10	3 9	3 8

## 50-YARD DASH

100	5.8	5.6	5.5	5.4	5.4
95	6.5	6.5	6.2	6.1	6.0
90	6.9	6.8	6.4	6.2	6.1
85	7.0	6.9	6.5	6.3	6.2
80	7.2	7.0	6.7	6.4	6.3
75	7.3	7.1	6.8	6.5	6.4
70	7.4	7.2	6.9	6.6	6.5
65	7.5	7.3	7.0	6.7	6.6
60	7.6	7.3	7.0	6.8	6.6
55	7.7	7.4	7.1	6.9	6.7
50	7.8	7.5	7.1	7.0	6.8
45	7.9	7.6	7.2	7.0	6.9
40	8.0	7.7	7.3	7.0	7.0
35	8.2	7.9	7.5	7.2	7.0
30	8.2	7.9	7.5	7.2	7.1
25	8.3	8.0	7.6	7.3	7.2
20	8.5	8.1	7.8	7.4	7.3
15	8.6	8.2	8.0	7.6	7.5
10	9.0	8.5	8.0	7.8	7.6
5	9.3	8.8	8.5	8.0	7.9
0	12.5	10.1	10.5	9.7	9.3

PERCENTILE SCORE	13 years	14 years	15 years	16 years	17 years
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## SHUTTLE RUN

100	8.1	8.1	8.0	8.2	8.5
95	9.7	9.4	9.3	9.1	9.0
90	10.0	9.8	9.5	9.3	9.2
85	10.2	9.9	9.8	9.4	9.3
80	10.3	10.0	10.0	9.5	9.5
75	10.5	10.2	10.0	9.6	9.6
70	10.6	10.2	10.1	9.8	9.8
65	10.7	10.4	10.2	10.0	10.0
60	10.8	10.5	10.4	10.0	10.0
55	11.0	10.6	10.5	10.2	10.1
50	11.0	10.8	10.6	10.3	10.3
45	11.3	10.9	10.7	10.4	10.5
40	11.5	11.0	10.9	10.5	10.6
35	11.6	11.1	11.0	10.7	10.8
30	11.8	11.2	11.2	10.9	10.9
25	12.0	11.4	11.3	11.0	11.1
20	12.3	11.5	11.5	11.2	11.3
15	12.5	11.8	11.7	11.5	11.5
10	13.0	12.0	12.0	12.0	12.0
5	13.2	12.5	12.0	12.6	12.5
0	18.0	15.2	15.0	17.5	17.5

## SOFTBALL THROW

100	242	231	257	263	265
95	171	190	207	214	231
90	160	178	197	205	221
85	153	169	189	195	210
80	148	163	182	190	212
75	143	158	177	185	198
70	136	153	171	180	193
65	133	150	168	178	189
60	129	147	164	172	185
55	125	144	159	168	181
50	121	139	156	165	176
45	119	135	153	160	172
40	115	131	150	156	167
35	112	127	145	154	163
30	108	123	140	150	161
25	103	118	135	147	156
20	98	113	130	140	151
15	92	106	123	133	143
10	85	100	115	120	130
5	73	90	102	102	115
0	36	47	50	48	64

PERCENTILE SCORE	13 years	14 years	15 years	16 years	17 years
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## 600-YARD RUN

100	1 40	1 30	1 23	1 30	1 25
95	2 00	1 50	1 43	1 40	1 36
90	2 05	1 56	1 50	1 45	1 44
85	2 10	2 02	1 55	1 48	1 48
80	2 13	2 05	1 60	1 51	1 51
75	2 15	2 08	2 01	1 54	1 54
70	2 18	2 11	2 05	1 56	1 55
65	2 21	2 13	2 07	1 59	1 58
60	2 25	2 18	2 09	2 00	2 00
55	2 27	2 20	2 10	2 03	2 02
50	2 29	2 22	2 14	2 05	2 04
45	2 32	2 25	2 17	2 07	2 06
40	2 36	2 30	2 20	2 10	2 09
35	2 40	2 34	2 24	2 12	2 14
30	2 44	2 37	2 28	2 16	2 17
25	2 50	2 44	2 31	2 23	2 22
20	2 57	2 48	2 35	2 30	2 26
15	3 02	3 00	2 42	2 36	2 35
10	3 15	3 14	2 55	2 41	2 44
5	3 39	3 33	3 16	3 02	3 05
0	5 45	5 45	5 37	5 35	5 00

## TESTS AND RESULTS

The following are the seven tests that were given. Instructions as to where they were given and how each test was conducted are followed by the results.

### Sit-ups

Equipment. Mat or floor.

Description. The pupil lies on his back, either on the floor or on a mat, with legs extended and feet about two feet apart. His hands are placed on the back of the neck with the fingers interlaced. Elbows are retracted. A partner holds the ankles down, the heels being in contact with the mat or floor at all times. The pupil sits up, turning the trunk to the left and touching the right elbow to the left knee, returns to the starting position, then sits up turning the trunk to the right and touching the left elbow to the right knee. The exercise is repeated, alternating sides.

### Rules.

1. The fingers must remain in contact behind the neck throughout the exercise.
2. The knees must be on the floor during the sit-up but may be slightly bent when touching elbow to knee.
3. The back should be rounded and the head and elbows brought forward when sitting up as a "Curl" up.
4. When returning to the starting position, elbows must be flat on the mat before sitting up again.

Scoring. One point was given for each complete movement of touching elbow to knee. No score was counted if the fingertips do not maintain contact behind the head, if knees were bent when the pupil laid on his back or when he began to sit up, or if the pupil pushed up off the floor from an elbow. The maximum limit of number of sit-ups was one hundred.

Table 1 indicates that abdominal strength and endurance is a strong area of physical fitness at Broomfield High School. The maximum number of sit-ups was one hundred. Ninth grade students averaged fifty-six sit-ups with a percentile average of seventy-six at the beginning of the school year. At the end of the school year, the ninth grade averaged ninety-five sit-ups with a percentile average of eighty-nine. The ninth grade averaged an increase of thirty-nine sit-ups and a percentile increase of thirteen.

At the beginning of the school year, the tenth grade averaged fifty-eight sit-ups with an average percentile score of seventy-nine. In the spring the average number of sit-ups was ninety-nine with an average percentile score of ninety-five, giving an average increase of sit-ups of forty-one and a percentile increase of sixteen.

The eleventh grade averaged eighty-five sit-ups in the fall with an average percentile score of eighty-eight. In the spring the average number of sit-ups was ninety with an average percentile increase of zero.

For the twelfth grade the average number of sit-ups was ninety-nine and the average percentile score was ninety-one in



the fall. In the spring the average number of sit-ups was ninety-nine and the percentile average was ninety-seven. The twelfth grade averaged an increase of zero sit-ups and a percentile increase of six.

Table 1. Results of the sit-up test.

Grade	Number of students	Average number of sit-ups	Average percentile score	Sit-up in- crease	Percentile increase
Fall					
Nine	67	56	76		
Ten	27	58	79		
Eleven	12	85	88		
Twelve	16	99	91		
TOTAL AVERAGE		74.5	83		
Spring					
Nine	59	95	89	39	13
Ten	26	99	95	41	16
Eleven	13	90	88	5	0
Twelve	14	99	97	0	6
TOTAL AVERAGE		75.75	92	21.25	9

#### Pull-ups

Equipment. A metal or wooden bar approximately  $1\frac{1}{2}$  inches in diameter. A doorway gym bar can be used and, if no regular equipment is available, a piece of pipe or even the rungs of a ladder can also serve the purpose.

Description. The bar should be high enough so that the

pupil can hang with his arms and legs fully extended and his feet free of the floor. Use the overhand grasp. After assuming the hanging position, the pupil raises his body by his arms until his chin can be placed over the bar and then lowers his body to a full hang as in the starting position. The exercise is repeated as many times as possible.

#### Rules.

1. Allow one trial unless it is obvious that the pupil has not had a fair chance.
2. The body must not swing during the execution of the movement. The pull must in no way be a snap movement. If the pupil starts swinging, check this by holding your extended arm across the front of the thighs.
3. The knees must not be raised and kicking of the legs is not permitted.

#### Scoring.

Record the number of completed pull-ups to the nearest whole number.

Table 2 indicates that the arm flexor muscles used in such activities as catching, tackling, holding in the arms and pulling are above the national average.

Ninth grade students averaged four pull-ups with a percentile average of sixty-two at the beginning of the school year. At the end of the school year, the average was four and five-tenths pull-ups with a percentile average of sixty-eight. The ninth grade averaged an increase of five-tenths pull-ups and a percentile increase of six.

At the beginning of the school year, the tenth grade averaged five pull-ups with an average percentile score of seventy-one. In the spring the average number of pull-ups was seven and eight-tenths with an average percentile score of eighty-four, giving an average increase of pull-ups of two and eight-tenths and a percentile increase of thirteen.

The eleventh grade averaged six pull-ups in the fall with an average percentile score of fifty-nine. In the spring the average number of pull-ups was seven and five-tenths with an average percentile score of seventy-four, giving an increase of one and five-tenths in pull-ups and a percentile increase of fifteen.

For the twelfth grade the average number of pull-ups was seven and the average percentile score was sixty-two in the fall. In the spring the average number of pull-ups was nine and eight-tenths and the percentile average was eighty-four. The twelfth grade averaged an increase of two and eight-tenths pull-ups and a percentile increase of twenty-two.

Table 2. Results of the pull-up test.

Grade	Number of students	Average number of pull-ups	Average percentile score	Pull-up in- crease	Percentile increase
Fall					
Nine	67	4	62		
Ten	27	5	71		
Eleven	12	6	59		
Twelve	16	7	62		
TOTAL AVERAGE		5.5	64		
Spring					
Nine	59	4.5	68	.5	6
Ten	26	7.8	84	2.8	13
Eleven	13	7.5	74	1.5	15
Twelve	14	9.8	84	2.8	22
TOTAL AVERAGE		7.4	78	1.9	14

## Standing Broad Jump

Equipment. Mat, floor or outdoor jumping pit, and a tape measure.

Description. Pupil stands with the feet several inches apart and the toes just behind the take-off line. Preparatory to jumping, the pupil swings the arms backward and bends the knees. The jump is accomplished by simultaneously extending the knees and swinging forward the arms.

### Rules.

1. Allow three trials.
2. Measure from the take-off line to the heel or other part of the body that touches the floor nearest the take-off line.
3. When the test is given indoors, it is convenient to tape the tape measure to the floor at right angles to the take-off line and have the pupils jump along the tape. The scorer stands to the side and observes the mark to the nearest inch.

Scoring. Record the best of the three trials in feet and inches to the nearest inch.

Table 3 indicates that leg extensor strength was poor at the beginning of the 1963-64 school year.

Ninth grade students averaged five feet ten inches with a percentile average of fifty-three at the beginning of the school year. At the end of the school year, the average was six feet two inches with a percentile average of sixty-five. The ninth grade averaged an increase of four inches and a percentile increase of twelve.

At the beginning of the school year, the tenth grade averaged five feet eleven inches with an average percentile score of forty-one. In the spring the average distance was seven feet one inch with an average percentile score of eighty-four, giving an average increase of distance of one foot two inches and a percentile increase of forty-three.

The eleventh grade averaged six feet eight inches in the fall with an average percentile score of fifty-three. In the spring the average distance was seven feet six inches with an average percentile score of eighty-four, giving an increase in distance of eleven inches and a percentile increase of thirty-one.

For the twelfth grade the average distance was six feet nine inches and the average percentile score was forty-four in the fall. In the spring the average distance was seven feet eight inches and the percentile average was eighty-four. The twelfth grade averaged an increase of one foot and a percentile increase of forty.

Table 3. Results of the standing broad jump test.

Grade	Number of students	Average distance	Average percentile score	Distance increase	Percentile increase
Fall					
Nine	67	5'10"	53		
Ten	27	5'11"	41		
Eleven	12	6'8"	53		
Twelve	16	6'9"	44		
TOTAL AVERAGE		6'2.7"	48		
Spring					
Nine	59	6'2"	65	4"	12
Ten	26	7'1"	84	1'2"	43
Eleven	13	7'6"	84	11"	31
Twelve	14	7'8"	84	1'	40
TOTAL AVERAGE		7'1.2"	79	10.25"	32

### Fifty-yard Dash

Equipment. Two stopwatches or one with split-second timer.

Description. It is preferable to administer this test to two pupils at a time. Have both take positions behind the starting line. The starter will use the commands "Are you ready?" and "Go". The latter will be accompanied by a downward sweep of the starter's arm to give the timer a visual signal.

Rules. The score is the amount of time between the starter's signal and the instant the pupil crosses the finish line.

Scoring. Record in seconds to the nearest tenth of a second.

Table 4 indicates that this is a weak area of physical fitness at Broomfield High School.

Ninth grade students averaged seven and five-tenths seconds with a percentile average of forty-nine at the beginning of the school year. At the end of the school year, the average was seven and one-tenth seconds with a percentile average of fifty-six. The ninth grade averaged a decrease of four-tenths second and a percentile increase of seven.

At the beginning of the school year, the tenth grade averaged six and nine-tenths seconds with an average percentile score of seventy. In the spring the average number of seconds was six and four-tenths with an average percentile score of eighty, giving an average decrease in seconds of five-tenths and a percentile increase of ten.

The eleventh grade averaged seven seconds in the fall, with

a percentile score of fifty-one. In the spring the average number of seconds was six and seven-tenths with an average percentile score of sixty-seven, giving a decrease in seconds of three-tenths and a percentile increase of sixteen.

For the twelfth grade the average number of seconds was six and seven-tenths and the average percentile score was fifty-seven in the fall. In the spring the average number of seconds was six and six-tenths and the percentile average was sixty-six. The twelfth grade averaged a decrease of one-tenth second and a percentile increase of nine.

Table 4. Results of the fifty-yard dash.

Grade	Number of students	Average number of seconds	Average percentile score	Seconds decrease	Percentile increase
Fall					
Nine	67	7.5	49		
Ten	27	6.9	70		
Eleven	12	7.0	51		
Twelve	16	6.7	57		
TOTAL AVERAGE		7.02	57		
Spring					
Nine	59	7.1	56	.4	7
Ten	26	6.4	80	.5	10
Eleven	13	6.7	67	.3	16
Twelve	14	6.6	66	.1	9
TOTAL AVERAGE		6.7	70	.325	11

### Shuttle Run

Equipment. Two blocks of wood, two inches by two inches by four inches, and a stopwatch. Pupils should wear sneakers or run barefooted.

Description. Two parallel lines are marked on the floor thirty feet apart. The width of a regulation volleyball court serves as a suitable area. Place the blocks of wood behind one of the lines. The pupil starts from behind the other line. On the signal, "Ready? Go!", the pupil runs to the blocks, picks one up, runs back to the starting line and places the block behind the line; he then runs back and picks up the second block which he carries back across the starting line. If the scorer has two stopwatches or one with a split-second timer, it is preferable to have two people running at the same time. To eliminate the necessity of returning the blocks after each race, start the races alternately, first from behind one line and then from behind the other.

Rules. Allow two trials with some rest between.

Scoring. Record the better of the two trials to the nearest tenth of a second.

Table 5 indicates that agility has risen above the national average at Broomfield High School.

Ninth grade students averaged ten and eight-tenths seconds with a percentile average of forty-eight at the beginning of the school year. At the end of the school year, the average was ten and five-tenths seconds with a percentile average of fifty-five.



The ninth grade averaged a decrease of three-tenths second and a percentile increase of seven.

At the beginning of the school year, the tenth grade averaged ten and five-tenths seconds with an average percentile score of fifty-seven. In the spring the average number of seconds was ten with an average percentile score of seventy-four, giving an average decrease in seconds of five-tenths second and a percentile increase of seventeen.

The eleventh grade averaged ten and two-tenths seconds in the fall with an average percentile score of fifty-seven. In the spring the average number of seconds was nine and eight-tenths with an average percentile score of seventy-two, giving a decrease of four-tenths second and a percentile increase of fifteen.

For the twelfth grade the average number of seconds was ten and the average percentile score was sixty-four in the fall. In the spring the average number of seconds was nine and eight-tenths seconds and the percentile average was seventy-one. The twelfth grade averaged a decrease of two-tenths second and a percentile increase of seven.

Table 5. Results of the shuttle run test.

Grade	Number of students	Average number of seconds	Average percentile score	Seconds decrease	Percentile increase
Fall					
Nine	67	10.8	48		
Ten	27	10.5	57		
Eleven	12	10.2	57		
Twelve	16	10.0	64		
TOTAL AVERAGE		10.25	57		
Spring					
Nine	59	10.5	55	.3	7
Ten	26	10.0	74	.5	17
Eleven	13	9.8	72	.4	15
Twelve	14	9.8	71	.2	7
TOTAL AVERAGE		10.02	68	.35	12

## Softball Throw for Distance

Equipment. Softball (12-inch), small metal or wooden stakes, and tape measure.

Description. A football field marked in conventional fashion (five-yard intervals) makes an ideal area for this test. If this is not available, it is suggested that lines be drawn parallel to the restraining line, five yards apart. The pupil throws the ball while remaining within two parallel lines, six feet apart. Mark the point of landing with one of the small stakes. If his second or third throw is farther, move the stake accordingly so that, after three throws, the stake is at the

point of the pupil's best throw. It was found to be expedient to have the pupil jog out to his stake and stand there; and then after five pupils have completed their throws, the measurements were taken. By having the pupil at his particular stake, there is little danger of recording the wrong score.

Rules.

1. Only an overhand throw may be used.
2. Three throws are allowed.
3. The distance recorded is the distance from the point of landing to the nearest point on the restraining line.

Scoring. Record the best of the three trials to the nearest foot.

Table 6 indicates that arm extension strength and speed is a strong area with much improvement during the year.

Ninth grade students averaged one hundred and forty-seven feet with a percentile average of fifty-nine at the beginning of the school year. At the end of the school year, the average was one hundred and eighty-two feet with a percentile average of eighty-two. The ninth grade averaged an increase of thirty-five feet and a percentile increase of twenty-three.

At the beginning of the school year, the tenth grade averaged one hundred and sixty-six feet with an average percentile score of sixty-three. In the spring the average number of feet was one hundred and eighty-five feet with an average percentile score of seventy-four, giving an average increase of nineteen feet and a percentile increase of eleven.

The eleventh grade averaged one hundred and seventy-eight

feet in the fall with an average percentile score of sixty-four. In the spring the average number of feet was one hundred and ninety with an average percentile score of eighty, giving an increase of twelve feet and a percentile increase of twenty-four.

For the twelfth grade the average number of feet was one hundred and eighty-one and the average percentile score was fifty-five in the fall. In the spring the average number of feet was one hundred and ninety-eight and the percentile average was seventy. The twelfth grade averaged an increase of seventeen feet and a percentile increase of nineteen.

Table 6. Results of the softball throw for distance.

Grade	Number of students	Average of number of feet	Average percentile score	Foot increase	Percentile increase
Fall					
Nine	67	147	59		
Ten	27	166	63		
Eleven	12	178	64		
Twelve	16	181	55		
TOTAL AVERAGE		168	60		
Spring					
Nine	59	182	82	35	23
Ten	26	185	74	19	11
Eleven	13	190	80	12	24
Twelve	14	198	74	17	19
TOTAL AVERAGE		188.75	78	20.75	19

## 600-Yard Run-walk

Equipment. Track or marked area and stopwatch.

Description. Pupil uses a standing start. At the signal, "Ready? Go!", the subject starts running the 600-yard distance. The running may be interspersed with walking. It is possible to have a dozen subjects run at one time by having pupils pair off before the start of the event. Then each pupil listens for and remembers his partner's time as the latter crosses the finish. The timer merely calls out the times as the pupils cross the finish.

Rules. Walking is permitted, but the object is to cover the distance in the shortest possible time.

Scoring. Record in minutes and seconds.

Table 7 indicates this is a moderately strong area but that there is definitely something lacking in the program. All grades are equal in both the fall and spring tests.

Ninth grade students averaged two minutes and eight seconds with a percentile average of seventy-five at the beginning of the school year. At the end of the school year, the average was two minutes and one second with a percentile average of seventy-four. The ninth grade averaged a decrease of seven seconds and a percentile increase of minus one.

At the beginning of the school year, the tenth grade averaged two minutes with an average percentile score of seventy-six. In the spring the average number of minutes and seconds was one minute and fifty-four seconds with an average percentile score of

seventy-five, giving a decrease of six seconds and a percentile increase of a minus one.

The eleventh grade averaged one minute and fifty-six seconds in the fall with an average percentile score of seventy-one. In the spring the average was one minute and fifty-three seconds with an average percentile score of seventy-six, giving a decrease of three seconds and a percentile increase of five.

For the twelfth grade the average number was one minute and fifty-five seconds and the average percentile score was seventy-one in the fall. In the spring the average was one minute and fifty-four seconds and the percentile average was seventy-four. The twelfth grade averaged a decrease of one second and a percentile increase of three.

Table 7. Results of the 600-yard run-walk.

Grade	Number of students	Average number of minutes	Average percentile score	Minutes decrease	Percentile increase
Fall					
Nine	67	2:08	75		
Ten	27	2:00	76		
Eleven	12	1:56	71		
Twelve	16	1:55	71		
TOTAL AVERAGE		2:01.2	73		
Spring					
Nine	59	2:01	74	:07	-1
Ten	26	1:54	75	:06	-1
Eleven	13	1:53	76	:03	5
Twelve	14	1:54	74	:01	3
TOTAL AVERAGE		1:55.2	75	:04	2

## SUMMARY

This report is a study of two basic areas in physical fitness at Broomfield High School. The first area includes methods for developing physical fitness. These are methods that are not always a physical fitness program in themselves, but are methods that fit into the learning process. This report takes into account many units that were in the physical education program at Broomfield High School.

The second area explores the evaluation of the program. There are seven tests that were given and each one is explained, tabled, and a conclusion was drawn. These tests included pull-ups, shuttle run, sit-ups, standing broad jump, 50-yard dash, softball throw, and the 600-yard run-walk.

The above mentioned tests measured strength, endurance, agility, and speed.

The results of the physical fitness tests influences the planning of the total program for the following year.

The average percentile increase for each grade was as follows:

Grade	September	May	Difference
Nine	61	85	+24
Ten	64	79	+15
Eleven	64	78	+14
Twelve	64	79	+14



## CONCLUSION

The evaluation of the program includes the following assumptions:

The method of physical fitness development is good because it achieves results, fits well into the learning process, and is not ultra time consuming.

The selection of physical activities is designed for all big muscle activity as shown by the improvement in this phase of the test.

The method of testing, suggested by the President's Youth Fitness Council, is reliable, valid, and does not take an unreasonable amount of time, having a reliable and valid method of evaluation.

Good classroom procedures were used.

The program was flexible and yet systematic.

The tests evaluation revealed that speed and agility were the lowest percentile activity ratings. More activities requiring speed and agility should be in the program. Some activities requiring speed and agility would be basketball, relays, wind sprints, soccer-type games, and field hockey.

The standing broad jump test had the highest percentile increase, possibly due to the gymnastics unit. This unit directly preceded the physical fitness tests and required a high performance in jumping.

The situp test had the highest percentile score of all the tests. This is possibly due to two circumstances. The abdominal



muscles are used to a large extent in almost all activities. The activity limits the student to one hundred repetitions, which causes this investigator to feel that this test may be less valid than the others.

Grade nine was the most improved class, with a twenty-four percentile increase. This was probably due to the fact that this class did not have physical fitness stressed in previous years.

The percentile increase for each class indicated that the 600-yard run-walk had a consistently low increase in percentile score, with a minus one for grades nine and ten, and an increased score of four and three for grades eleven and twelve respectively. The scores were all high, with the four grades receiving scores in the seventies. Running has been emphasized the past three years at Broomfield High School, and the conditioning of the boys physical education students has reached a constant high level.

There was a large increase in the scores of the softball throw. This may have been due to the numerous arm extensor exercises in the calisthenics, such as the push-up, inverted push-up, and isometric exercises. Also, the crab position activities could have played an important role in the development of arm extensor strength.

The increase in pull-ups was likely due to the gymnastic unit, where rope climbing was required.

It was also found that a student participating in interschool athletics benefited greatly from the physical fitness program. The average boy that participated in three interschool

sports a year had an average percentile score of sixty-five and did not vary from this score more than two per cent during the 62-63 school year. During the 63-64 school year the average percentile score rose to eighty-five per cent for the same boys.

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A STUDY OF THE PHYSICAL FITNESS PHASE  
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AT BROOMFIELD HIGH SCHOOL, BROOMFIELD, COLORADO

by

GORDON W. HARPER

B. S., Kansas State University, 1959

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Physical Education

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1965

This report is based on the development of a physical fitness program in the Broomfield High School boys' physical education classes.

The contents of this report include methods for physical fitness development, classroom organization techniques in relation to physical fitness, types of physical fitness tests, methods of administering physical fitness tests, scoring the physical fitness tests, and the evaluation of the physical fitness program.

Methods of physical fitness development include the relationship of physical fitness to the learning process, how to insert physical fitness development activities into games and contests, isolated physical fitness development activities, and calisthenics that were used specifically for physical fitness development.

The AAHPER\* tests evaluation revealed that speed and agility were the lowest percentile activity ratings. More activities requiring speed and agility should be in the program. Some activities requiring speed and agility would be basketball, relays, wind sprints, soccer-type games, and field hockey.

The standing broad jump test had the highest percentile increase possibly due to the gymnastics unit. This unit directly preceded the physical fitness tests and required a high performance in jumping.

The situp test had the highest percentile score of all the tests. This is possibly due to two circumstances. The abdominal

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\* American Association for Health, Physical Education and Recreation.

muscles are used, to a large extent, in almost all activities. The activity limits the student to one hundred repetitions.

Grade nine was the most improved class, with a twenty-four percentile increase. This is probably due to the fact that this class did not have physical fitness stressed in previous years.

The percentile increase for each class indicated that the 600-yard run-walk had a consistently low increase in percentile score. The scores were all high, with the four grades achieving scores in the seventies. Running has been emphasized the past three years at Broomfield High School and the conditioning of the boys' physical education students has reached a constant high level.

There was a high increase in the softball throw. This may have been due to the numerous arm extensor exercises in the calisthenics, such as the push-up, inverted push-up, and isometric exercises. Also, the crab position activities could have played a large part in developing arm extensor strength.

The increase in pull-ups was likely due to the gymnastic unit where rope climbing was required.

The development of the program has been most encouraging and the evaluation most enlightening.